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Feature Article - Investigations of Volatility in the Labour Force Survey

INTRODUCTION

The key ABS Labour Force Survey (LFS) estimates of employed persons and unemployed persons change from month to month in a way that is to some extent unpredictable. This erratic behaviour of a time series is called 'volatility'. The accompanying feature article uses graphical methods to examine the volatility in the LFS. This Technical Note reports further analysis of this volatility, which confirm and extend the results evident in the Feature Article.

As for the feature article, this note looks at the 'irregulars' of the time series, which are treated as measuring the monthly effects of volatility. It also looks at the contribution of sampling error to the volatility. The following questions are addressed:

Are the irregulars normally distributed, or are they spread out towards the extremes?

Is there any evidence that the volatility of the series has changed over time?

Is there a relationship between month to month irregulars?

IRREGULARS OF A TIME SERIES

The irregulars are a result of the time series decomposition of the survey estimates into trend, seasonal and irregular components. For presentation here this decomposition will be treated as additive. (The actual decomposition for LFS estimates of employed persons and unemployed persons is done separately for a number of component series, using a multiplicative approach, and then aggregated to the Australia level). The time series decomposition can be written as:

Survey estimate = Trend + Seasonal + Irregular

The seasonally adjusted estimates are simply the survey estimates with the seasonal component removed. Thus the irregular can be calculated from published data by subtracting the trend estimate from the seasonally adjusted estimate.

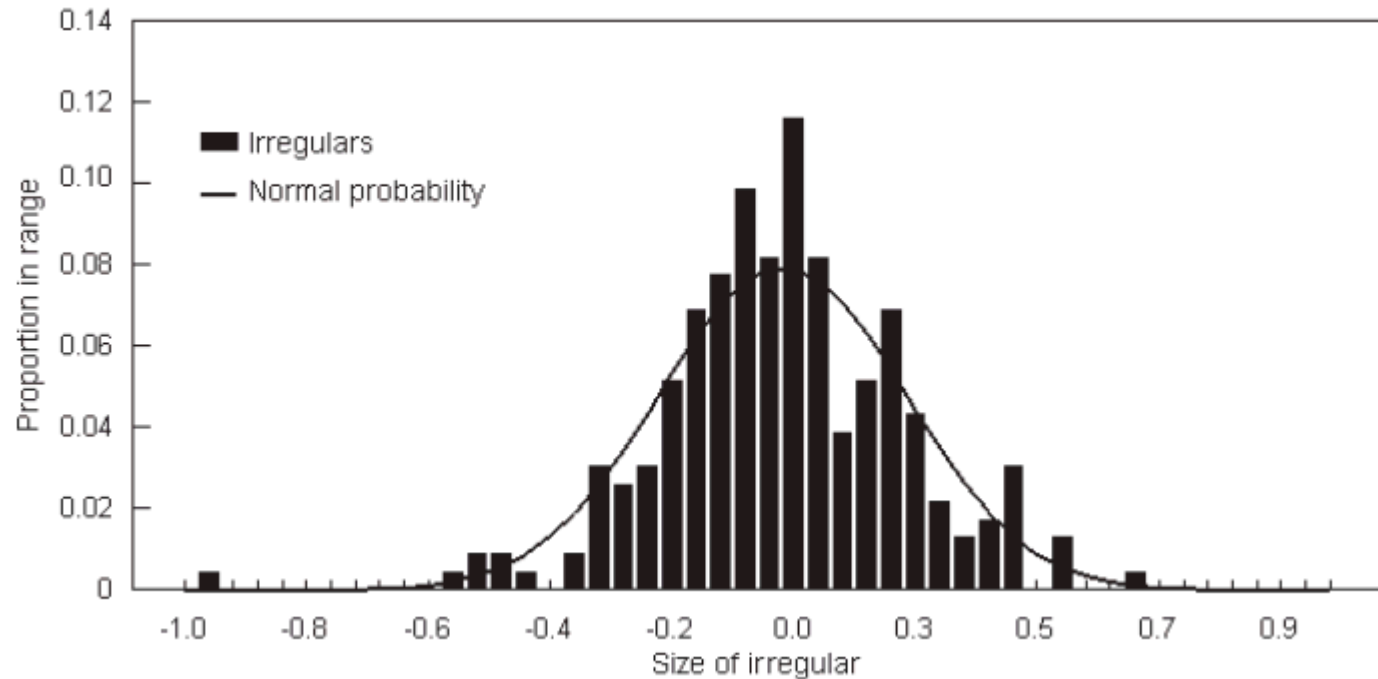
DISTRIBUTION OF THE IRREGULARS

Graphs 1 and 2 show the number of times that relative irregulars of particular sizes have been observed since February 1978 (the start of the monthly LFS), for employed and unemployed persons respectively. Overlaid on each graph is the expected frequency distribution for a normal distribution of the same standard deviation. The standard deviations of the relative irregulars are 0.21 percentage points for employed persons and 1.65 percentage points for unemployed persons.

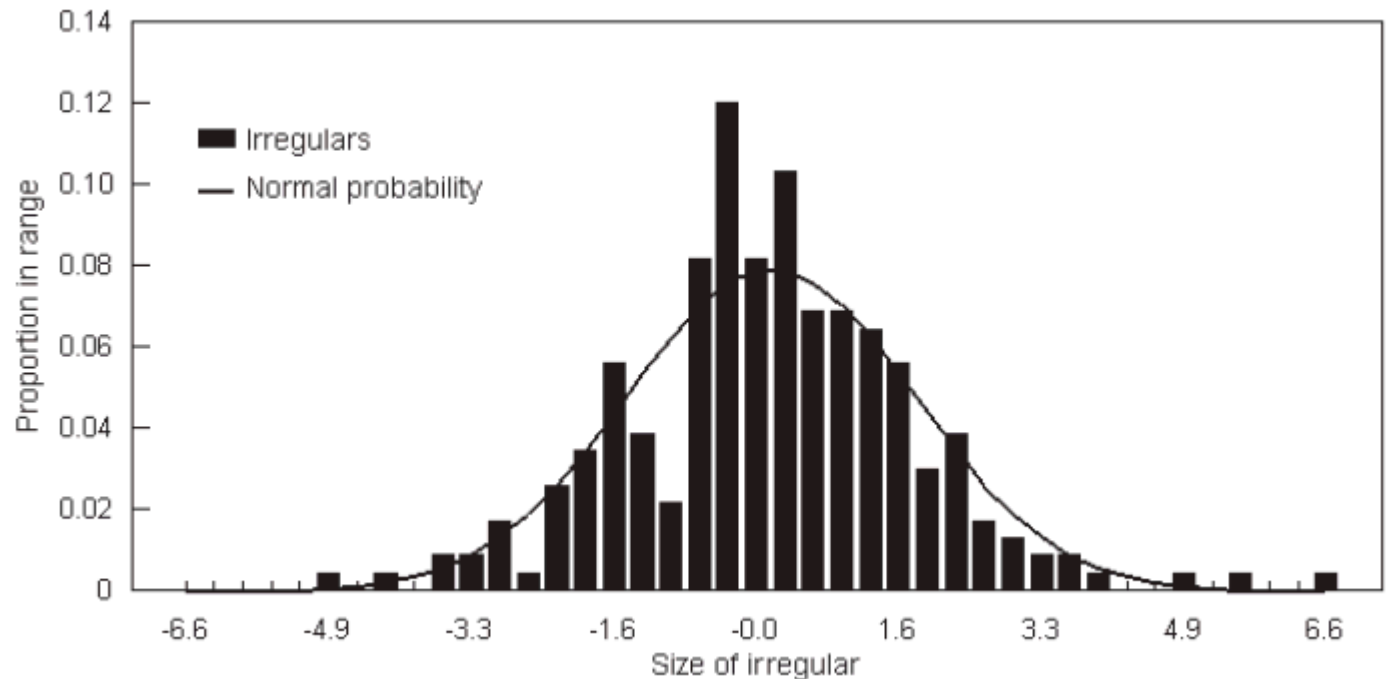
It appears that the observed irregulars are approximately centred at zero, and their variation is similar to the normal distribution. This is confirmed by formal statistical tests. The Kolmogorov D-test did not detect any significant difference from the normal distribution (giving $p=0.61$ for employed persons and $p=0.28$ for unemployed persons as probabilities of observing these irregulars if they were from a normal distribution).

Given the irregulars seem to follow a normal distribution, it is not surprising that occasional irregulars appear that are relatively far from zero, even though most of the observed irregulars are small and close to zero. Occasional large values among a majority of small values is typical for data that are normally distributed.

GRAPH 1: EMPLOYED PERSONS, AUSTRALIA, DISTRIBUTION OF RELATIVE IRREGULARS



GRAPH 2: UNEMPLOYED PERSONS, AUSTRALIA, DISTRIBUTION OF RELATIVE IRREGULARS



MAGNITUDE OF THE IRREGULARS OVER TIME

The graphs of irregulars in the feature article (**Graphs 3 and 4**) show them as being equally scattered above and below zero. This is inevitable, as over time they must average out to zero. It is of interest to consider the magnitude of the irregulars, and to ask: ignoring whether they are positive or negative, have the standardised irregulars become bigger or smaller over time?

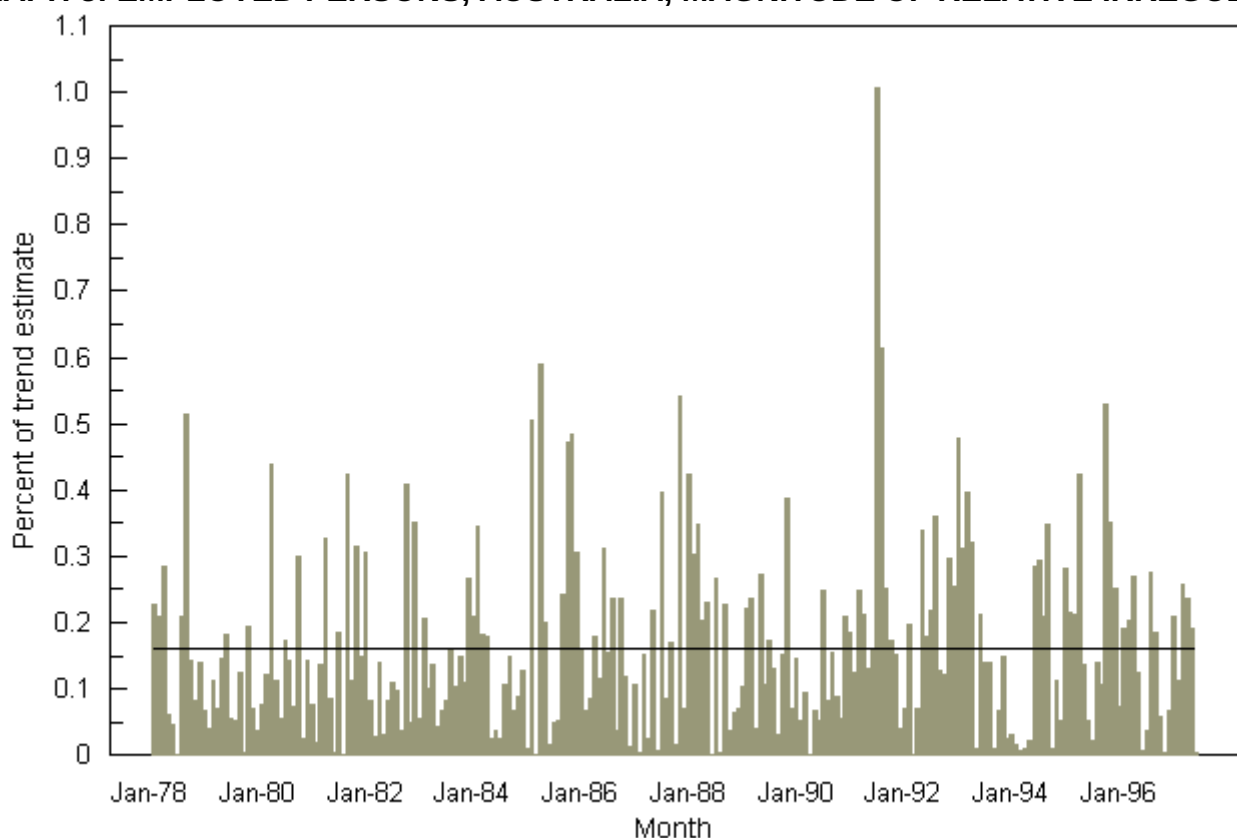
Graphs 3 and 4 show the absolute values of the relative irregulars i.e. they show the magnitude of the irregulars, relative to the estimate, without regard to sign. The horizontal line on each graph shows the average magnitude of the relative irregulars over the whole span of data. For employed persons, the average size of the relative irregulars has been about 0.16%, looked at over the whole period of the survey. For unemployed persons, the average size of the relative irregulars has been about 1.25%.

These graphs support the view that there has been no observable deterioration in the stability of the LFS estimates over time. If there had been, there would be a clear pattern of values below the average early in the life of the survey, and above the average in more recent times. This does not occur, for either employed or unemployed persons.

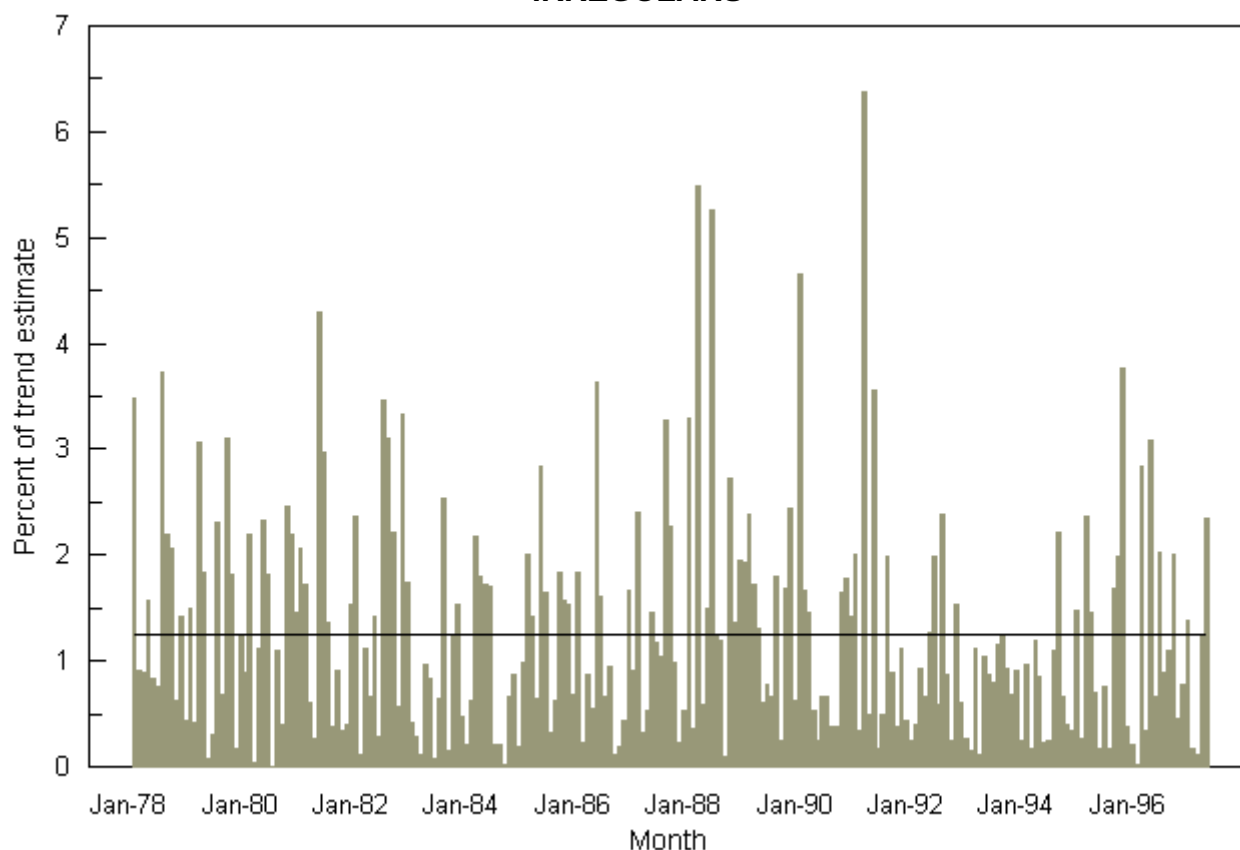
Another feature is drawn out by this presentation. Throughout each series there have been 'quiet' episodes, lasting for periods of around six to nine months, where the volatility of the survey has been below the average, followed by slightly shorter 'noisier' periods, where the volatility has been above the average.

This effect may contribute to occasional concerns in the public arena that LFS estimates are becoming more volatile. This may be the appearance in the short term, when a period of relative stability has been followed by a more volatile period. In the longer term, however, both the employed persons and unemployed persons series have shown no overall increase in volatility.

GRAPH 3: EMPLOYED PERSONS, AUSTRALIA, MAGNITUDE OF RELATIVE IRREGULARS



GRAPH 4: UNEMPLOYED PERSONS, AUSTRALIA, MAGNITUDE OF RELATIVE IRREGULARS



SAMPLING ERROR

A major contributor to the volatility of the survey estimates is the sampling error. Sampling error is an unavoidable part of any survey, arising because only a portion of the population is surveyed in any month. Assuming negligible survey bias, the effect of sampling error on survey estimates can be written as

Survey estimate = True population value + Sampling error

The sampling error on estimates will be approximately normal for theoretical reasons, so it is not surprising that the irregulars appear normal. For further discussion of sampling errors in the LFS see Labour Force, Australia (6203.0).

CONCLUSIONS

The following conclusions can be drawn about the volatility of the Labour Force estimates of employed persons and unemployed persons. First, the irregulars are approximately normal in distribution. Second, the magnitude of the irregulars is not increasing appreciably over time. Third, there is a tendency for the irregulars to show periods of low volatility separated by shorter periods of higher volatility.

FURTHER INFORMATION

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